agent on the first affinity surface is complementary to and binds to the affinity agent on the magnetic particle. The code is then detached from the coded magnetic binding complex. The detached code then binds to a magnetic signal affinity complex to form a coded magnetic signal binding complex. Typically the affinity agent of the magnetic signal affinity complex is complementary to the code. In one embodiment, the affinity agent of the magnetic signal affinity complex is a polynucleotide complementary to the code polynucleotide. The microcoil array is activated to move the coded magnetic signal binding complex to one or multiple detection zones comprising a second affinity surface. Typically different areas of the detection zone or the different detection zones contain unique affinity agents to the codes. The affinity agents of the second affinity surface are complementary to and bind the code. The detection element then detects the coded magnetic signal binding complex in the detection zone using electrical sensing methods, optical sensing methods, or enzymatic methods, such as amplifying the affinity agent (if it is a polynucleotide) on the magnetic signal affinity complex.

[0090] "Detach" refers to the separation of the code molecule from the affinity agent of the magnetic particle. It can be detached using any method known to those of skill in the art. In one embodiment, it is detached by heating. In other embodiments, it is enzymatically detached.

[0091] The term "nucleotide" includes deoxynucleotides, ribonucleotides and analogs thereof. These analogs are those molecules having some structural features in common with a naturally occurring nucleotide such that when incorporated into a polynucleotide sequence, they allow hybridization with a complementary polynucleotide in solution. Typically, these analogs are derived from naturally occurring nucleotides by replacing and/or modifying the base, the ribose or the phosphodiester moiety. The changes can be tailor-made to stabilize or destabilize hybrid formation, or to enhance the specificity of hybridization with a complementary polynucleotide sequence as desired, or to enhance stability of the polynucleotide.

[0092] The term "polynucleotide" or "nucleic acid" as used herein refers to a polymeric form of nucleotides of any length, either ribonucleotides or deoxyribonucleotides, that comprise purine and pyrimidine bases, or other natural, chemically or biochemically modified, non-natural, or derivatized nucleotide bases. Polynucleotides of the embodiments of the invention include sequences of deoxyribopolynucleotide (DNA), ribopolynucleotide (RNA), or DNA copies of ribopolynucleotide (cDNA) which may be isolated from natural sources, recombinantly produced, or artificially synthesized. A further example of a polynucleotide of the embodiments of the invention may be polyamide polynucleotide (PNA) or linked polynucleotide (LNA). The polynucleotides and nucleic acids may exist as single-stranded or double-stranded. The backbone of the polynucleotide can comprise sugars and phosphate groups, as may typically be found in RNA or DNA, or modified or substituted sugar or phosphate groups. A polynucleotide may comprise modified nucleotides, such as methylated nucleotides and nucleotide analogs. The sequence of nucleotides may be interrupted by non-nucleotide components. The polymers made of nucleotides such as nucleic acids, polynucleotides and polynucleotides may also be referred to herein as "nucleotide polymers.

[0093] When the biomolecule or macromolecule of interest is a peptide, the amino acids can be any amino acids, including α, β, or ω-amino acids. When the amino acids are α-amino acids, either the L-optical isomer or the D-optical isomer may be used. Additionally, unnatural amino acids, for example, β-alanine, phenylglycine and homoarginine are also contemplated by the embodiments of the invention. These amino acids are well-known in the art.

[0094] A "peptide" is a polymer in which the monomers are amino acids and which are joined together through amide bonds and alternatively referred to as a polypeptide. In the context of this specification it should be appreciated that the amino acids may be the L-optical isomer or the D-optical isomer. Peptides are two or more amino acid monomers long, and often more than 20 amino acid monomers long.

[0095] A "protein" is a long polymer of amino acids linked via peptide bonds and which may be composed of two or more polypeptide chains. More specifically, the term "protein" refers to a molecule composed of one or more chains of amino acids in a specific order; for example, the order as determined by the base sequence of nucleotides in the gene coding for the protein. Proteins are essential for the structure, function, and regulation of the body's cells, tissues, and organs, and each protein has unique functions. Examples are hormones, enzymes, and antibodies.

[0096] The term "sequence" refers to the particular ordering of monomers within a macromolecule and it may be referred to herein as the sequence of the macromolecule.

[0097] The term "hybridization" refers to the process in which two single-stranded polynucleotides bind non-covalently to form a stable double-stranded polynucleotide; triple-stranded hybridization is also theoretically possible. The resulting (usually) double-stranded polynucleotide is a "hybrid." The proportion of the population of polynucleotides that forms stable hybrids is referred to herein as the "degree of hybridization." For example, hybridization refers to the formation of hybrids between a probe polynucleotide (e.g., an affinity agent polynucleotide of the invention which may include substitutions, deletion, and/or additions) and a specific analyte polynucleotide wherein the probe preferentially hybridizes to the specific analyte polynucleotide and substantially does not hybridize to polynucleotides consisting of sequences which are not substantially complementary to the analyte polynucleotide. However, it will be recognized by those of skill that the minimum length of a polynucleotide desired for specific hybridization to a target polynucleotide will depend on several factors: G/C content, positioning of mismatched bases (if any), degree of uniqueness of the sequence as compared to the population of analyte polynucleotides, and chemical nature of the polynucleotide (e.g., methylphosphonate backbone, phosphorothiolate, etc.), among others.

[0098] Methods for conducting polynucleotide hybridization assays have been well developed in the art. Hybridization assay procedures and conditions will vary depending on the application and are selected in accordance with the general binding methods known in the art.

[0099] It is appreciated that the ability of two single stranded polynucleotides to hybridize will depend upon factors such as their degree of complementarity as well as the stringency of the hybridization reaction conditions.

[0100] As used herein, "stringency" refers to the conditions of a hybridization reaction that influence the degree to which polynucleotides hybridize. Stringent conditions can be selected that allow polynucleotide duplexes to be distinguished based on their degree of mismatch. High stringency is correlated with a lower probability for the formation of a